



MACHINES OF WAR

handbook



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CONTENTS

Aircraft

| | |
|------------------------|----|
| U.S. aircraft | 3 |
| British aircraft | 14 |
| German aircraft | 23 |

Vehicles and Weapons

| | |
|----------------|----|
| Vehicles | 35 |
| Weapons | 43 |
| Ships | 45 |

Aircraft Armaments

| | |
|----------------------------------|----|
| Rifle-caliber machine guns | 48 |
| Heavy machine guns | 49 |
| Automatic cannon | 50 |
| Heavy cannon | 52 |
| Torpedoes | 53 |
| Rockets | 54 |

The Aircraft of CFS3

A NOTE TO THE PILOT: You've got a tough job ahead of you, but you can select the right plane for each mission from an impressive stable of aircraft. You can choose from a variety of single-seaters, including some hot piston-and-propeller fighters and some up-to-the minute jet-propelled jobs. Need a twin-engine aircraft to get the job done? Take your pick. With a war on, aviation technology is moving fast. Here's your chance to fly the best planes in the arsenal.



Curtiss P-55 Ascender



P-55

This futuristic bird's swept wing, canard elevators, rear engine, and pusher propeller gave it a look like no other fighter. However, the experimental 24-cylinder liquid-cooled flat-H engine originally intended for the Ascender never reached production. Its 2,200 horsepower might have provided a top speed over 500 mph. The Allison V-12 that replaced the proposed Pratt & Whitney engine reduced the plane's performance from stellar to average. Low-speed handling problems, including a vicious stall with little or no warning, were partially addressed by modifications to the prototype's wings and vertical surfaces, but with jet aircraft already under development, the Ascender project was abandoned after the third prototype. For a fascinating "what-if" scenario and a unique piloting experience, try the Ascender as it might have been, with 75 percent more power and improved handling.



P-55 SPECIFICATIONS

(the aircraft in CFS3, as originally designed)

WEIGHT: 6,354/7,929 lb. (2,888/3,604 kg)

SPAN: 41' 0.5" (12.5 m) **LENGTH:** 29' 7" (9 m)

ENGINE: One Pratt & Whitney R-2600 24-cyl. liquid-cooled flat-H with 2,200 hp

ARMAMENT: Two 0.5-in. Browning machine guns with 200 r.p.g. on nose, plus two 20-mm Hispano M2 cannon with 150 r.p.g. in nose

MAX SPEED @ ALTITUDE: 507 mph (815 km/h) @ 20,000 ft (6,096 m)

CEILING: 36,000 ft (10,973 m)

INITIAL CLIMB RATE: 3,500 ft/min (1,066 m/min)

RANGE: 1,000 mi (1,610 km)

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STRENGTHS

- With proposed Pratt & Whitney engine, excellent speed.
- Excellent forward visibility.
- Two .50s and two 20-mm cannon in nose concentrate heavy firepower.
- Improved control surfaces make for nimble handling.
- Tricycle landing gear enhances forward visibility, makes landings less risky.

WEAKNESSES

- Unique profile makes it easy for enemies to identify.
- Poor rearward visibility.

XP-55 SPECIFICATIONS

(the prototype aircraft actually built in 1943-1944)

WEIGHT: 6,354/7,929 lb. (2,888/3,604 kg)

SPAN: 41' 0.5" (12.5 m) **LENGTH:** 29' 7" (9 m)

ENGINE: One Allison V-1710-95 liquid-cooled V-12 with 1,275 hp

ARMAMENT: Four 0.5-in. Browning machine guns in nose with 200 r.p.g.

MAX SPEED @ ALTITUDE: 390 mph (628 km/h) @ 19,300 ft (5,882 m)

CEILING: 34,600 ft (10,546 m)

INITIAL CLIMB RATE: 2,800 ft/min (853 m/min)

RANGE: "Normal" 635 mi (1,021 km); "maximum" 1,440 mi (2,316 km)

* * *

STRENGTHS (PROTOTYPE AS BUILT)

- Good level and climbing flight characteristics.
- Excellent forward visibility.
- Four .50s in nose concentrate firepower.
- Tricycle landing gear enhances forward visibility, makes landings less risky.

WEAKNESSES (PROTOTYPE AS BUILT)

- Unique profile makes it easy for enemies to identify.
- Poor rearward visibility.
- Minimal stall warning.
- Some lateral instability, common in tailless aircraft.
- With Allison engine, mediocre speed.
- Lack of elevator "feel" can lead to pilot overcontrol on landing.



Lockheed P-38J & P-38L Lightning



When the P-38 Lightning first flew in 1939, its striking appearance and high performance made a powerful first impression, but it took several design changes to realize the potential of this radical brainchild of design genius Kelly Johnson. Its twin-engine reliability and long range were significant assets, its counter-rotating propellers neutralized torque effects and made the P-38 a smooth aircraft to fly, and its heavy firepower and modern tricycle landing gear made it popular with pilots. While the big, fast, and heavy Lightning was slower-turning and less maneuverable than single-engine fighters, it could outdive any fighter except the P-47 Thunderbolt. Late-model P-38s, particularly the almost identical J and L models, came into their own in Europe serving the Ninth Air Force in the ground-attack role. The electric dive flaps and power-boosted ailerons of the late production P-38Js and all P-38Ls increased stability and tamed the compressibility problems in steep dives that had dogged early Lightnings. The L model of this big, fast, heavily armed fighter featured more powerful engines for superior acceleration and added bombs and rockets to its cannon and guns to devastate enemy targets.



P-38J SPECIFICATIONS

WEIGHT: 12,780/21,600 lb. (5,806/9,798 kg)
SPAN: 52' (15.85 m) **LENGTH:** 37' 10" (11.52 m)
ENGINE: Two Allison V-1710-89/91 liquid-cooled V-12s with 1,425 hp each
ARMAMENT: One 20-mm Hispano M2 cannon with 150 rounds, plus four 0.5-in. machine guns with 500 r.p.g., plus up to 3,200 lb. of bombs
MAX SPEED @ ALTITUDE: 414 mph (666 km/h) @ 25,000 ft (7,620 m)
CEILING: 44,000 ft (13,410 m)
INITIAL CLIMB RATE: 2,850 ft/min (870 m/min)
RANGE: 450 mi (724 km)

* * *

P-38L SPECIFICATIONS

WEIGHT: 12,800/21,600 lb. (5,806/9,798 kg)
SPAN: 52' (15.85 m) **LENGTH:** 37' 10" (11.52 m)
ENGINE: Two Allison V-1710-111/ 113 liquid-cooled V-12s with 1,475 hp each (1,600 hp each at war emergency power)
ARMAMENT: One 20-mm Hispano M2 cannon with 150 rounds, plus four 0.5-in. machine guns with 500 r.p.g., plus either two 4,000-lb. bombs or ten 5-in. rockets
MAX SPEED @ ALTITUDE: 414 mph (666 km/h) @ 25,000 ft (7,620 m)
CEILING: 44,000 ft (13,410 m)
INITIAL CLIMB RATE: 2,850 ft/min (870 m/min)
RANGE: 450 mi (724 km)

* * *

STRENGTHS (ALL P-38 VARIANTS)

- Fast, good climb rate, and, except for the P-47, unbeatable in a dive.
- Supplements heavy armament with bombs and rockets.
- Counter-rotating props eliminate torque effects.
- Twin-engine reliability.
- Nose-mounted guns concentrate firepower and decrease convergence errors.
- Excellent forward visibility.

WEAKNESSES (ALL P-38 VARIANTS)

- Not as maneuverable as smaller, lighter single-engine fighters.
- Unique profile makes it easy for enemies to identify.
- Liquid cooling increases engine vulnerability to damage from flak and small arms fire.



Lockheed P-80A Shooting Star



P-80A

P-80A SPECIFICATIONS

WEIGHT: 7,920/14,000 lb. (3,600/6,364 kg)

SPAN: 38' 10.5" (11.84 m) **LENGTH:** 34' 6" (10.5 m)

ENGINE: One General Electric J-33-GE-9 turbojet with 3,850-lb. thrust

ARMAMENT: Six 0.5-in. Browning machine guns with 300 r.p.g., plus two 500-lb. or 1,000-lb. bombs or (on F-80C) ten 5-in. rockets

MAX SPEED @ ALTITUDE: 558 mph (898 km/h) @ sea level; 533 mph (858 km/h) @ 20,000 ft (6,096 m)

CEILING: 45,000 ft (13,716 m)

INITIAL CLIMB RATE: 4,166 ft/min (1,270 m/min)

RANGE: 780 mi (1,255 km); 1,100 mi (1,770 km) with two 165-gal. drop tanks

* * *

First flown as a prototype in January 1944, the P-80 became the first jet aircraft adopted for service by the USAAF, but production models became available just weeks too late to serve in WWII. The Shooting Star was another brainchild of the Lockheed design team headed by Clarence "Kelly" Johnson, whose work also included the exotic P-38 Lightning and the SR-71 "Blackbird." Its clean design, relatively powerful turbojet engine, and thin unswept laminar-flow wing made the P-80 an excellent performer for the time. Its speed, maneuverability, and armament qualified it as both an excellent fighter and fighter-bomber. The Shooting Star development project took an unexpected toll on August 6, 1945--the day the atom bomb was dropped on Hiroshima. Richard Bong, America's top-scoring WWII ace, died on a test flight in California when his P-80 flamed out and stalled on takeoff.

* * *

STRENGTHS

- High speed.
- Excellent climb and maneuverability.
- Well-armed gunfighter can also deliver ordnance.
- Nose-mounted guns concentrate firepower and decrease convergence errors.

WEAKNESSES

- Slow engine spool-up and acceleration.
- Poor engine reliability.



Martin B-26C & B-26G Marauder



The Marauder's greatest success as a workhorse of the U.S. Ninth Air Force came in the tactical air support role before, during, and after the Allied invasion of Europe in 1944. Heavy armament and a big bomb load made the B-26 devastatingly effective in this role. Its highly loaded wing made the Marauder a "hot" plane with a high landing speed, a characteristic that cost some early crews their lives. Wing and fin modifications, and an aggressive training program, decreased operational accidents and helped get the best out of this capable aircraft. The C model increased the wing's span by six feet; the later F and G models increased the wing's angle of incidence by 3.5 degrees to shorten takeoff distance and decrease landing speed. By the end of the war, the B-26 had the lowest loss rate of all of the American bombers in the European Theater.

**B-26C SPECIFICATIONS****WEIGHT:** 23,800/38,200 lb. (10,818/17,363 kg)**SPAN:** 71' (21.6 m) **LENGTH:** 56' 1" (17 m)**ENGINE:** Two Pratt & Whitney R-2800-43 18-cyl. air-cooled radials with 2,000 hp each**ARMAMENT:** Twelve 0.5-in. Browning machine guns--one flexible and one fixed gun in the nose (fixed gun later omitted), four fixed-package guns on the sides, two in the top turret, two in the lower waist, and two in the tail--plus 3,000 lb. of bombs. Optional: Fourteen 5-in. rockets**MAX SPEED @ ALTITUDE:** 283 mph (455 km/h) @ 5,000 ft (1,524 m)**CEILING:** 19,800 ft (6,035 m)**INITIAL CLIMB RATE:** 1000 ft/min (305 m/min)**RANGE:** 1,150 mi (1,850 km)

* * *

B-26G SPECIFICATIONS**WEIGHT:** 23,800/38,200 lb. (10,818/17,363 kg)**SPAN:** 71' (21.6 m) **LENGTH:** 56' 1" (17 m)**ENGINE:** Two Pratt & Whitney R-2800-43 18-cyl. air-cooled radials with 2,000 hp each**ARMAMENT:** Twelve 0.5-in. Browning machine guns (as above, but without fixed nose gun), plus 4,000-lb. of bombs. Optional: Fourteen 5-in. rockets**MAX SPEED @ ALTITUDE:** 283 mph (455 km/h) @ 5,000 ft (1,524 m)**CEILING:** 19,800 ft (6,035 m)**INITIAL CLIMB RATE:** 1000 ft/min (305 m/min)**RANGE:** 1,150 mi (1,850 km)

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STRENGTHS (ALL B-26 VARIANTS)

- High-speed cruise.
- Heavy armament and bomb load.

WEAKNESSES (ALL B-26 VARIANTS)

- High landing speed dangerous for unwary pilots.
- Vulnerable to fighters, requires escort.



North American P-51B and P-51D Mustang



Once the Mustang got Rolls-Royce Merlin power in the P-51B, it excelled in every role, including tactical fighter-bomber. The bubble canopy of the D model added superior visibility. Fast and agile as an interceptor, the P-51 gave Allied forces excellent tactical support in the ground attack role. Its heavy gun armament, combined with bombs and rockets, helped the Ninth Air Force suppress enemy ground forces and transport, speeding the advance of Patton's Third Army across France and into Germany. The Mustang's only flaw as a fighter-bomber was its liquid-cooled engine, a liability it shared with other front-line aircraft, including the Spitfire, Typhoon, Tempest, and Bf 109. A piece of flak or a small-arms round in the coolant system could turn this otherwise potent attack aircraft into a very short-range glider.



P-51D

P-51B SPECIFICATIONS**WEIGHT:** 7,125/11,600 lb. (3,230/5,206 kg)**SPAN:** 37' 0.25" (11.29 m) **LENGTH:** 32' 2.5" (9.81 m)**ENGINE:** One Rolls-Royce/Packard V-1650-3 liquid-cooled V-12 with 1,380 hp**ARMAMENT:** Four 0.5-in. Browning machine guns with 400 r.p.g., plus two 500-lb. or 1000-lb. bombs**MAX SPEED @ ALTITUDE:** 440 mph (708 km/h) @ 30,000 ft (7,620 m)**CEILING:** 41,800 ft (12,740 m)**INITIAL CLIMB RATE:** 2,780 ft/min (847 m/min)**RANGE:** 1,300 mi (2,092 km); 2,080 mi (3,347 km) with drop tanks

* * *

P-51D SPECIFICATIONS**WEIGHT:** 7,125/11,600 lb. (3,230/5,206 kg)**SPAN:** 37' 0.25" (11.29 m) **LENGTH:** 32' 2.5" (9.81 m)**ENGINE:** One Rolls-Royce/ Packard V-1650-7 liquid-cooled V-12 with 1,490 hp**ARMAMENT:** Six 0.5-in. Browning machine guns with 270 r.p.g. (outboard & center pairs) & 400 r.p.g. (inboard pair), plus two 500-lb. or 1000-lb. bombs or six 5-in. rockets**MAX SPEED @ ALTITUDE:** 437 mph (703 km/h) @ 25,000 ft (9,144 m)**CEILING:** 41,900 ft (12,780 m)**INITIAL CLIMB RATE:** 3,125 ft/min (952 m/min)**RANGE:** 1,300 mi (2,092 km); 2,080 mi (3,347 km) with drop tanks

* * *

STRENGTHS (ALL P-51 VARIANTS)

- Excellent acceleration, speed, handling, and maneuverability.
- Enormous range.
- Heavy firepower from six .50-inch guns.
- Excellent pilot visibility.

WEAKNESSES (ALL P-51 VARIANTS)

- Very sensitive to sudden throttle application, which can cause severe swing or rollover and crash on takeoff.
- Treacherous handling with aft fuselage tank full.
- Liquid cooling increases engine vulnerability to damage from flak and small arms fire.



Republic P-47D (early models) & P-47D-25 Thunderbolt



The biggest, heaviest fighter of the war, the Thunderbolt was also the most successful American fighter-bomber of WWII. Nicknamed the "Jug" either because it resembled a squat milk jug or as an abbreviation of "Juggernaut," it was ruggedly built and powered by a massive and durable air-cooled radial engine. The Thunderbolt could absorb damage that would knock other fighters down and still keep flying. It was also easy to fly with light stick forces, and very forgiving. Commencing with the P-47D-25 production block, the ungainly "Jug" became more sleek and provided better visibility with its bubble canopy and slimmed-down aft fuselage. U.S. Ninth Air Force Thunderbolts joined British Typhoons and Tempests as a devastating tactical air support weapon. It combined high performance with heavy firepower and a big ordnance load to become the American aircraft of choice in the ground attack role.



P-47D SPECIFICATIONS

(Early models)

WEIGHT: 9,900/14,925 lb. (4,500/6,784 kg)

SPAN: 40' 9.25" (12.4 m) **LENGTH:** 36' 1.25" (11.03 m)

ENGINE: One Pratt & Whitney R-2800-21 Double Wasp 18-cyl. air-cooled radial with 2,000 hp

ARMAMENT: Eight 0.5-in. Browning machine guns with 267 or 425 r.p.g., plus two 1000-lb. or three 500-lb. bombs or ten 5-in. rockets

MAX SPEED @ ALTITUDE: 428 mph (689 km/h) @ 30,000 ft (9,150 m)

CEILING: 42,000 ft (12,810 m)

INITIAL CLIMB RATE: 3,120 ft/min (950 m/min)

RANGE: 1,000 mi (1,610 km); 1,900 mi (3,057 km) with drop tanks

* * *

P-47D-25 SPECIFICATIONS

WEIGHT: 10,300/19,400 lb. (4,545/8,818 kg)

SPAN: 40' 9.25" (12.4 m) **LENGTH:** 36' 1.25" (11.03 m)

ENGINE: One Pratt & Whitney R-2800-59 Double Wasp 18-cyl. air-cooled radial with 2,000 hp (2,300 hp with water injection for war emergency power)

ARMAMENT: Eight 0.5-in. Browning machine guns with 267 or 425 r.p.g., plus two 1000-lb. or three 500-lb. bombs or ten 5-in. rockets

MAX SPEED @ ALTITUDE: 428 mph (689 km/h) @ 30,000 ft (9,150 m)

CEILING: 42,000 ft (12,810 m)

INITIAL CLIMB RATE: 3,120 ft/min (950 m/min)

RANGE: 1,000 mi (1,610 km); 1,900 mi (3,057 km) with drop tanks

* * *

STRENGTHS (ALL P-47 VARIANTS)

- Fast, stable, easy to fly, forgiving; a confidence-builder for novice pilots.
- Impressive roll rate.
- Nothing outdives a Jug.
- Extremely rugged construction.
- Massive firepower from eight 0.5-in. guns.
- Heavy ordnance load.
- Bubble canopy provides excellent visibility.
- Air-cooled radial engine shields pilot and can sustain major damage yet keep running.

WEAKNESSES (ALL P-47 VARIANTS)

- Tends to "mush" in a dive, losing altitude rapidly; pull out in time or dig a big hole.
- Not as maneuverable as smaller, lighter fighters.
- Mediocre turn radius and rate.
- Poor zoom climb; loses energy rapidly.



de Havilland Mosquito B. IV, F.B. VI, and F.B. XVIII

Mosquito



Affectionately known as the "Wooden Wonder" or the "Mossie," the fast and versatile Mosquito served first as a light, unarmed bomber, and then as Britain's most successful night fighter. In mid-1943 its most numerous variant, the F.B. VI fighter-bomber, appeared. Designed from the start to use nonstrategic materials, its molded plywood construction made the Mosquito light and strong. Its twin Merlin V-12s gave it sufficient speed to outrun most fighters at low to medium altitudes, and its heavy armament and bomb load made it a formidable fighter-bomber. The F.B. XVIII, a variant of the F.B. VI, was armed with a 57-mm antitank cannon. Its bigger bite earned it the nickname "Tse Tse." The RAF's Second Tactical Air Force demonstrated the Mosquito's effectiveness against ground targets, while Coastal Command showed what its guns and rocket salvos could do against enemy shipping.



MOSQUITO B. IV SPECIFICATIONS

WEIGHT: 14,100/22,500 lb. (6,409/10,227 kg)
SPAN: 54' 2" (16.5 m) **LENGTH:** 40' 9" (12.4 m)
ENGINE: Two Rolls-Royce Merlin 21 liquid-cooled V-12s with 1,230 hp each
ARMAMENT: No defensive armament; 2,000-lb. of bombs (four 500-lb. bombs in internal bomb bay)
MAX SPEED @ ALTITUDE: 380 mph (611 km/h) @ 17,000 ft (5,182 m)
CEILING: 28,800 ft (8,778 m)
INITIAL CLIMB RATE: 1,700 ft/min (518 m/min)
RANGE: 1,860 mi (2,992 km) with maximum bomb load

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MOSQUITO F.B. VI SPECIFICATIONS

WEIGHT: 14,100/22,500 lb. (6,409/10,227 kg)
SPAN: 54' 2" (16.5 m) **LENGTH:** 40' 6" (12.3 m)
ENGINE: Two Rolls-Royce Merlin 25 liquid-cooled V-12s with 1,635 hp each
ARMAMENT: Four 20-mm Hispano cannon in belly under nose with 150 r.p.g., plus four 0.303-in. Browning machine guns on nose with 500 r.p.g., plus 2,000 lb. of bombs (in fuselage & under wings) or 1,000 lb. of bombs and eight 60-lb. rocket projectiles
MAX SPEED @ ALTITUDE: 380 mph (611 km/h) @ 13,000 ft (3,962 m)
CEILING: 36,000 ft (10,973 m)
INITIAL CLIMB RATE: 1,870 ft/min (570 m/min)
RANGE: 1,205 mi (1,938 km) with internal fuel; 1,705 mi (2,743 km) with full load and auxiliary tanks

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MOSQUITO F.B. XVIII SPECIFICATIONS

WEIGHT: 14,100/22,500 lb. (6,409/10,227 kg)
SPAN: 54' 2" (16.5 m) **LENGTH:** 40' 6" (12.3 m)
ENGINE: Two Rolls-Royce Merlin 25 liquid-cooled V-12s with 1,635 hp each
ARMAMENT: Four .303-in. Browning machine guns on nose with 500 r.p.g., plus one 57-mm Molins cannon with 25 rounds, plus 1,000 lb. of bombs and eight 60-lb. rocket projectiles
MAX SPEED @ ALTITUDE: 380 mph (611 km/h) @ 13,000 ft (3,962 m)
CEILING: 36,000 ft (10,973 m)
INITIAL CLIMB RATE: 1,870 ft/min (570 m/min)
RANGE: 1,205 mi (1,938 km) with internal fuel; 1,705 mi (2,743 km) with full load and auxiliary tanks

* * *

STRENGTHS (ALL VARIANTS)

- High speed, especially at lower altitudes.
- Heavy armament.

WEAKNESSES (ALL VARIANTS)

- Not as rugged as stressed aluminum aircraft.
- Easy for enemy pilots to identify.



de Havilland Vampire F.1



VAMPIRE F.1 SPECIFICATIONS

WEIGHT: 6,372/10,480 lb. (2,896/4,764 kg)

SPAN: 40' (12.2 m) **LENGTH:** 30' 9" (9.4 m)

ENGINE: One de Havilland Goblin II turbojet with 3,100-lb. thrust

ARMAMENT: Four 20-mm Hispano cannon with 150 r.p.g.

MAX SPEED @ ALTITUDE: 540 mph (869 km/h) @ 20,000 ft (6,096 m)

CEILING: 42,800 ft (13,045 m)

INITIAL CLIMB RATE: 4,200 ft/min (1,280 m/min)

RANGE: 730 mi (1,175 km)

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The Vampire (Britain's second jet fighter after the Gloster Meteor) was just months too late for service in WWII; the first production aircraft took to the air in April 1945. Its single-engine, twin-boom design made it the first Allied jet to match the performance of the German Messerschmitt 262. The Vampire served first as a high-speed interceptor, and later (under the designation F.B. 5) as a close support fighter-bomber carrying 2,000 pounds of bombs or rockets. It is tantalizing to imagine how encounters between the Vampire and the German jet fighters might have gone. Do well enough in conventional aircraft, and you may earn the opportunity to find out firsthand.

* * *

STRENGTHS

- Fast and maneuverable.
- Four 20-mm cannon deliver a massive punch.

WEAKNESSES

- Leisurely acceleration.
- Short engine life.



Hawker Typhoon IB



TYphoon IB SPECIFICATIONS

WEIGHT: 8,800/11,400 lb. (4,000/5,182 kg)

SPAN: 41' 7" (12.7 m) **LENGTH:** 31' 10" (9.7 m)

ENGINE: One Napier Sabre IIA 24-cyl. liquid-cooled flat-H with 2,180 hp

ARMAMENT: Four 20-mm Hispano cannon with 140 r.p.g., plus two 1,000-lb. bombs or eight 60-lb. rocket projectiles

MAX SPEED @ ALTITUDE: 405 mph (652 km/h) @ 18,000 ft (5,486 m)

CEILING: 34,000 ft (10,363 m)

INITIAL CLIMB RATE: 2,540 ft/min (774 m/min)

RANGE: 510 mi (820 km) with bombs; 980 mi (1,577 km) without bombs and with drop tanks

* * *

The Typhoon was Hawker's successor to the aging Hurricane. Its big, ambitious design was based on the massive 36-liter Napier Sabre flat-H engine. While the complex and maintenance-intensive Sabre never provided outstanding reliability, it did provide well over 2,000 horsepower, which gave the Typhoon far greater performance than anything imagined when the Hurricane was new. The Typhoon was rushed into service late in 1941, but some serious shortcomings prevented it from fulfilling its intended role of interceptor. Its thick wing made for instability at high altitudes, and its poorly designed aft fuselage caused the tail to break away during fast, steep dives. By late 1942 its structural problems were worked out, and the Typhoon came into its own as a powerful and heavily armed low-level fighter-bomber. After the Normandy invasion, Typhoons of the Second Tactical Air Force destroyed concentrations of German armor and made the roads of France and Belgium unsafe for enemy troops or transport.

* * *

STRENGTHS

- High speed.
- Heavy armament and ordnance load.

WEAKNESSES

- Poor handling and performance above 20,000 feet.
- For its power, a relatively leisurely rate of climb.
- Poor engine reliability.



Hawker Tempest V



Tempest V

TEMPEST V SPECIFICATIONS

WEIGHT: 9,000/13,500 lb. (4,205/6,364 kg)

SPAN: 41' (12.5 m) **LENGTH:** 33' 8" (10.26 m)

ENGINE: Napier Sabre IIB 24-cyl. liquid-cooled flat-H, 2,400 hp.

ARMAMENT: Four 20-mm Hispano cannon with 150 r.p.g., plus two 1,000-lb. bombs or eight 60-lb. rocket projectiles

MAX SPEED @ ALTITUDE: 435 mph (700 km/h) @ 17,000 ft (5,185 m)

CEILING: 36,000 ft (10,980 m)

INITIAL CLIMB RATE: 3,000 ft/min (914 m/min)

RANGE: 820 mi (1,320 km)

* * *

The Hawker Tempest V, successor to the Typhoon fighter-bomber, was the biggest, most potent piston-powered fighter flown by the RAF in World War II. The Tempest's massive 24-cylinder flat-H engine gave it more than 2,000 horsepower and a sound like no other fighter, its thin laminar flow wing gave it high speed without the handling problems that dogged the thick-winged Typhoon, and its four 20-mm cannon and ability to carry rockets or a ton of bombs made it a formidable fighter-bomber. The Tempest became operational in April 1944, just in time to take on the growing threat from the V1 buzz bombs raining down on London. Between June and September, RAF Tempest pilots shot down 638 Vls. During the last months of the war in Europe, the Tempest served with distinction in the RAF's Second Tactical Air Force. While much of this service was in the ground attack role, Tempest pilots also destroyed 20 Me 262 jet fighters in air combat. There are very few situations or adversaries you can't handle in this versatile fighter.

* * *

STRENGTHS

- High speed.
- Heavy armament and ordnance load.
- Excellent performance at high and low altitudes.

WEAKNESSES

- Less than stellar reliability from complex Napier Sabre engine.



North American B-25C (Mitchell II), B-25H, & B-25J (Mitchell III)



B-25C SPECIFICATIONS

WEIGHT: 20,300/34,000 lb. (9,227/15,455 kg)
SPAN: 67' 7" (20.6 m) **LENGTH:** 52' 11" (16.13 m)
ENGINE: Two Wright R-2600-13 14-cyl. air-cooled radials with 1,700 hp each
ARMAMENT: Five 0.5-in. machine guns (one in nose, two each in dorsal and ventral turrets), plus 3,000 lb. of bombs **Optional:** solid nose with eight .50s.
MAX SPEED @ ALTITUDE: 284 mph (457 km/h) @ 15,000 ft (4,572 m)
CEILING: 21,200 ft (6,462 m)
INITIAL CLIMB RATE: 1,880 ft/min (573 m/min)
RANGE: 1,500 mi (2,413 km)

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The B-25, a strong and versatile aircraft, may have been the best medium bomber of World War II. During the war the British received some 800 Mitchell medium bombers from the U.S. The H model added the formidable firepower of a nose-mounted 75-mm cannon. With the J model, the glazed two-gun nose could be replaced with a solid "strafing" nose carrying eight Browning .50s to devastate surface targets. The British put their Mitchells to excellent use in both the close-support role before the Normandy invasion and in attacks against German flying-bomb sites and other key targets afterward. The Mitchell was also a formidable weapon against surface targets, particularly in the up-gunned H and J models. In whatever role it was used, the Mitchell was reliable, stable, maneuverable, and easy to fly.

* * *

STRENGTHS (ALL B-25 VARIANTS)

- Good speed and maneuverability.
- Stable, easy to fly.
- Can deliver a significant payload on target.
- Can mount additional gunpacks to increase firepower.

WEAKNESSES (ALL B-25 VARIANTS)

- Slower and less maneuverable than fighters, and therefore requires escort.



B-25H

**B-25H SPECIFICATIONS**

WEIGHT: 20,300/34,000 lb. (9,227/15,455 kg)
SPAN: 67' 7" (20.6 m) **LENGTH:** 52' 11" (16.13 m)
ENGINE: Two Wright R-2600-13 14-cyl. air-cooled radials with 1,700 hp each
ARMAMENT: Fourteen 0.5-in. machine guns (four in solid nose, four in packs on sides of fuselage, two each in dorsal turret and tail, and one in each beam position), plus one 75-mm T13E1 cannon in nose below guns
MAX SPEED @ ALTITUDE: 272 mph (438 km/h) @ 13,000 ft (3,962 m)
CEILING: 24,200 ft (7,376 m)
INITIAL CLIMB RATE: 1,100 ft/min (338 m/min)
RANGE: 1,350 mi (2,172 km)

B-25J

**B-25J SPECIFICATIONS**

WEIGHT: 19,480/35,000 lb. (8,855/15,909 kg)
SPAN: 67' 7" (20.6 m) **LENGTH:** 52' 11" (16.13 m)
ENGINE: Two Wright R-2600-92 14-cyl. air-cooled radials with 1,700 hp each
ARMAMENT: Twelve 0.50-in. machine guns (two in nose, four in packs on sides of fuselage, two each in dorsal turret, tail, and beam positions), plus 3,000 lb. of bombs and eight 5-in. rockets **Optional:** solid nose with eight .50s for a total of eighteen .50s.
MAX SPEED @ ALTITUDE: 272 mph (438 km/h) @ 13,000 ft (3,962 m)
CEILING: 24,200 ft (7,376 m)
INITIAL CLIMB RATE: 1,100 ft/min (338 m/min)/min
RANGE: 1,350 mi (2,172 km)



Supermarine Spitfire Mk L.F. IXc and L.F. IXe



Many pilots believed the Mk IX was the ultimate Spitfire. Originally conceived in 1942 as a stopgap model to meet the threat of the German Focke-Wulf Fw 190 fighter, the Mk IX combined a Mk V fuselage with more powerful versions of the Rolls-Royce Merlin V-12. Eventually produced in low-, medium-, and high-altitude fighter versions (called, respectively, L.F., F., and H.F.), a total of 5,665 planes were built, mostly the low-altitude version. By 1944, RAF had assigned the interceptor role to later-model Griffon-engined Spitfires, and the IX was modified to specialize in the ground-attack role. Fitted with the new "E" wing, which carried upgraded armament consisting of two outboard 20-mm cannon and an inboard pair of 0.50-inch machine guns, the new L.F. IXe fighter-bomber also had its wingspan shortened by about four feet by squaring its elliptical wing-tips. The result was an excellent tactical weapon to support the Allied advance across Europe.



L.F. IXE

L.F. IXC SPECIFICATIONS**WEIGHT:** 5,610/7,500 lb. (2,545/3,409 kg)**SPAN:** 36' 10" (11.2 m) **LENGTH:** 29' 11" (9.1 m)**ENGINE:** One Rolls-Royce Merlin 66 liquid-cooled V-12 with 1,720 hp**ARMAMENT:** Two 20-mm Hispano cannon with 120 r.p.g., plus four 0.303-in. Browning machine guns, plus one 500-lb. bomb and two 250-lb. bombs**MAX SPEED @ ALTITUDE:** 404 mph (650 km/h) @ 21,000 ft (6,400 m)**CEILING:** 42,500 ft (12,954 m)**INITIAL CLIMB RATE:** 3,125 ft/min (952 m/min)**RANGE:** 434 mi (698 km); 980 mi (1,576 km) with drop tanks

* * *

L.F. IXE SPECIFICATIONS**WEIGHT:** 5,800/7,500 lb. (2,636/3,409 kg)**SPAN:** 32' 7" (9.9 m) **LENGTH:** 31' 4" (9.5 m)**ENGINE:** One Rolls-Royce Merlin 66 liquid-cooled V-12 with 1,720 hp**ARMAMENT:** Two 20-mm Hispano cannon with 120 r.p.g., plus two 0.50-in. Browning machine guns with 250 r.p.g., plus one 500-lb. and two 250-lb. bombs or eight 60-lb. rockets**MAX SPEED @ ALTITUDE:** 404 mph (650 km/h) @ 21,000 ft (6,400 m)**CEILING:** 42,500 ft (12,954 m)**INITIAL CLIMB RATE:** 3,125 ft/min (952 m/min)**RANGE:** 434 mi (698 km); 980 mi (1,576 km) with drop tanks

* * *

STRENGTHS (ALL VARIANTS)

- Excellent low-altitude performance.
- Mixed .50s and 20-mm guns give heavy punch.
- Can deliver a devastating mix of bombs and rockets.

WEAKNESSES (ALL VARIANTS)

- Inferior handling at high altitudes, especially for clipped-wing IXe.
- Liquid cooling increases engine vulnerability to damage from flak and small arms fire.



Dornier Do 335A-1 & B-2 Pfeil ("Arrow")



Do 335A-1

This big and radical fighter-bomber was powered by a pair of Daimler-Benz V-12s--one in the nose driving a conventional propeller, and one mounted inside the aft fuselage driving a pusher propeller on the tail. With power to spare, the 335 could fly, or even take off, on just one engine without the instability associated with losing an engine on a conventional twin-engine aircraft. With both engines it provided excellent performance, but the aft engine provided some special difficulties for bailing out. The pilot first had to fire explosive bolts to jettison the rear propeller and upper tail fin. By the end of the war, 37 "A" model fighter-bombers had rolled off the assembly line, but apparently none saw action before VE-Day. Two B-2 high-altitude "destroyer" prototypes carrying two additional 30-mm wing-mounted cannon had also been completed. Like so many late-war German exotics, the radical design of this big Dornier suggests some tantalizing "what-if" scenarios. Here's your chance to find out how the "Arrow" performs in combat.



Do 335B-2

DO 335A-1 SPECIFICATIONS

WEIGHT: 16,314/25,800 lb. (7,400/11,727 kg)
SPAN: 45' 3.33" (13.8 m) **LENGTH:** 45' 5.25" (13.8 m)
ENGINE: Two Daimler-Benz DB 603A-2 liquid-cooled V-12s with 1,750 hp each
ARMAMENT: One 30-mm Mk 103 cannon with 70 rounds firing through prop spinner, plus two 15-mm MG 151 cannon with 200 r.p.g. on the nose, plus 1,100 lb. of bombs in internal bomb bay
MAX SPEED @ ALTITUDE: 475 mph (764 km/h) @ 21,000 ft (6,400 m); max cruise 425 mph (685 km/h)
CEILING: 37,400 ft (11,400 m)
INITIAL CLIMB RATE: 2,523 ft/min (769 m/min)
RANGE: 1,280 mi (2,050 km); 2,330 mi (3,750 km) with external tank

* * *

DO 335B-2 SPECIFICATIONS

WEIGHT: 16,314/25,800 lb. (7,400/11,727 kg)
SPAN: 45' 3.33" (13.8 m) **LENGTH:** 45' 5.25" (13.8 m)
ENGINE: Two Daimler-Benz DB 603E liquid-cooled V-12s with 1,800 hp each
ARMAMENT: Three 30-mm Mk 103 cannon (one firing through prop spinner and one in each wing), plus two 20-mm MG 151 cannon on nose
MAX SPEED @ ALTITUDE: 475 mph (764 km/h) @ 21,000 ft (6,400 m); max cruise 425 mph (685 km/h)
CEILING: 37,400 ft (11,400 m)
INITIAL CLIMB RATE: 2,523 ft/min (769 m/min)
RANGE: 1280 mi (2,050 km); 2,330 mi (3,750 km) with external tank

* * *

STRENGTHS (ALL 335 VARIANTS)

- Good speed.
- Twin-engine safety.
- Wide, tricycle landing gear designed for operation from unimproved airstrips or grass fields.

WEAKNESSES (ALL 335 VARIANTS)

- Some handling difficulties at high speed, including "porpoising" and "snaking."
- Big, heavy fighter can't turn with lighter, nimbler adversaries.
- Liquid cooling increases engines' vulnerability to damage from flak and small arms fire.
- Cruciform tail and detachable propeller make bailing out problematic.
- Poor rearward visibility.



Focke-Wulf Fw 190A Würger ("Shrike") models A-5 and A-8



When the Fw 190 entered service in 1941, it quickly proved to be an outstanding fighter: small and fast, tough and responsive, highly maneuverable and well armed, it helped many a novice fighter pilot become an ace. One proof of the 190's superior design was its ability to carry numerous equipment and armament combinations while continuing to provide excellent performance. The 190 did have its drawbacks: its less-than-stellar rate of climb, vicious stall behavior, and reduced performance above 20,000 feet were the price one paid for its otherwise potent performance. The A-5 model, which entered combat early in 1943, moved the engine forward 5.9 inches to improve cooling and restore the center of gravity with increased armament; numerous variants were equipped with mission-specific accessory kits. At the end of 1943 the A-8 entered service, again in numerous mission-specific variants. The 190 proved so versatile and effective as a fighter-bomber that this thoroughbred was chosen to replace the plow horse of the Luftwaffe, the lumbering and highly vulnerable Stuka dive-bomber.



FW 190A-5 SPECIFICATIONS

WEIGHT: 7,055/10,800 lb. (3,207/4,910 kg)

SPAN: 34' 5.25" (10.49 m) **LENGTH:** 29' 6" (9 m)

ENGINE: One BMW 801D-2 14-cyl. air-cooled radial with 1,700 hp

ARMAMENT: Two 7.9-mm MG 17 machine guns on nose, two 20-mm MG 151 cannon in wing roots, two MG FF cannon outboard on wings, and centerline rack for one 1100-lb. or two 550-lb. or four 110-lb. bombs

MAX SPEED @ ALTITUDE: 394 mph (634 km/h) @ 18,000 ft (5,484 m)

CEILING: 37,400 ft (11,395 m)

INITIAL CLIMB RATE: 2,350 ft/min (716 m/min)

RANGE: 500 mi (805 km); 700 mi (1,125 km) with two 79.25-gallon (300-liter) drop tanks

* * *

FW 190A-8 SPECIFICATIONS

WEIGHT: 7,055/10,800 lb. (3,207/4,910 kg)

SPAN: 34' 5.25" (10.49 m) **LENGTH:** 29' 6" (9 m)

ENGINE: BMW 801D-2 14-cyl. air-cooled radial with 1,700 hp (2,100 hp with MW 50 water/methanol injection system activated)

ARMAMENT: Two 13-mm MG 131 machine guns on nose, two 20-mm MG 151 cannon in wing roots, two MG 151s outboard on wings, and centerline rack for one 1,100-lb. or two 550-lb. or four 110-lb. bombs, or for twenty-four R4M rockets or fourteen antitank rocket bombs

MAX SPEED @ ALTITUDE: 408 mph (656 km/h) @ 20,600 ft (6,279 m)

CEILING: 37,400 ft (11,395 m)

INITIAL CLIMB RATE: 2,350 ft/min (716 m/min)

RANGE: 500 mi (805 km); 700 mi (1,125 km) with two 79.25-gallon (300-liter) drop tanks

* * *

STRENGTHS (ALL 190A VARIANTS)

- Excellent performance without full fuel and armament load.
- Can be upgraded with various armament kits and still maintain good performance.
- Stable gun platform.
- Fast and easy to fly with excellent, responsive high-speed handling and phenomenal roll rate.
- Strongly built; can sustain damage & keep fighting.
- Air-cooled radial engine can take a lot of damage.
- Strong, wide landing gear makes landing easy.
- Excellent all-around visibility through canopy.

WEAKNESSES (ALL 190A VARIANTS)

- Degraded performance when fully laden.
- Unexceptional turning radius and rate of climb.
- Sudden and vicious stall characteristics.
- Poor zoom climb; loses energy rapidly.



Gotha Go 229A-0



GO 229A-0 SPECIFICATIONS

WEIGHT: 11,170/19,840 lbs (5,077/9,018 kg)

SPAN: 55' 0.625" (16.78 m) **LENGTH:** 24' 60.125" (7.47 m)

ENGINE: Two Junkers 109-0048 turbojets with 1,984 lb. (900 kg) thrust each

ARMAMENT: Four 30-mm MK 103 cannon with 120 r.p.g.

Optional: two 2,205-lb. (1,000-kg) bombs

MAX SPEED @ ALTITUDE: 607 mph (977 km/h) @ 39,370 ft (12,000 m)

CEILING: 52,500 ft (16,000 m)

INITIAL CLIMB RATE: 4,330 ft/min (1,320 m/min)

RANGE: 1,180 mi (1,900 km)

* * *

When soldiers of the U.S. Third Army arrived at the Gothaer Waggonfabrik factory at Friedrichsrode in April 1945, they found five of these futuristic jet-propelled flying wing fighters under construction. The prototype had flown two months earlier, and although it was destroyed and its pilot killed on its third flight when an engine failed, the project pressed ahead. Based on the ninth tailless aircraft design of Reimar and Walter Horten and assigned to Gotha for production, this twinjet fighter-bomber would have given Allied pilots a nasty shock. Its ultramodern appearance, very heavy armament, and extraordinary speed make it the subject of some of the most exciting "what-if" scenarios of WWII aviation. Now you can climb into this Buck Rogers machine and discover for yourself how it performs in combat.

* * *

STRENGTHS

- Extremely high speed.
- Very heavy armament and big bomb load.

WEAKNESSES

- Some lateral instability due to tailless design.
- Jumo turbojets are very fragile, provide short operational life (25 hours or less), and can't withstand even minor combat damage.
- Engines require cautious throttle control.
- Big, heavy aircraft can't maneuver with more nimble fighters.



Junkers Ju 88A-4, C-6, and P-4



Ju 88

The best of the German medium bombers, the Ju 88, was modified throughout the war into some 60 versions to fill many roles, including heavy day fighter, low-level intruder, heavily armed ground attacker, and night fighter. The A model, with its distinctive angular "beetle eye" glazed nose, was the most numerous bomber version. The C model, a heavy fighter-bomber version, had a solid nose, increased nose armament, and various options including a jettisonable twin-cannon belly pack and wing racks that increased its total bomb load to 3,300 pounds. Crews sometimes painted the solid nose of the C model to simulate the appearance of the more vulnerable A model. Another ground attack version, the P model, carried a forward-firing 50-mm cannon in a belly-mounted gondola. In its various forms, the Ju 88 became an aircraft that could deliver a lot of devastation against ground targets and shipping--and some unpleasant surprises for enemy aircraft.



JU 88A-4 SPECIFICATIONS

WEIGHT: 21,737/30,865 lb. (9,860/14,000 kg)
SPAN: 65' 7.5" (20 m) **LENGTH:** 47' 2.75" (14.4 m)
ENGINE: Two Junkers Jumo 211J-1 liquid-cooled V-12s with 1,350 hp each
ARMAMENT: One 7.92-mm MG 81 and one 13-mm MG 131 (or two MG 81s) in nose, two aft-firing MG 81s, plus one aft-firing MG 131 in ventral gondola
MAX SPEED @ ALTITUDE: 292 mph (470 km/h) @ 15,000 ft (4,572 m)
CEILING: 26,900 ft (8,200 m)
INITIAL CLIMB RATE: 1,770 ft/min (539 m/min)
RANGE: 1,112 mi (1,790 km); 1,696 mi (2,730 km) with drop tanks

* * *

JU 88C-6 & P-4 SPECIFICATIONS

WEIGHT: 21,737/30,865 lb. (9,860/14,000 kg)
SPAN: 65' 7.5" (20 m) **LENGTH:** 47' 2.75" (14.4 m)
ENGINE: Two Junkers Jumo 211J liquid-cooled V-12s with 1,410 hp each
ARMAMENT: (C-6) Three 20-mm MG FF cannon and three 7.9-mm MG 17 machine guns in nose, one rear-firing 13-mm MG 131 machine gun, plus 3,300 lb. of bombs (2,000 lb. internal and 1,300 lb. on wing racks)
Optional: belly gun pack with two 20-mm MG FF cannon
ARMAMENT: (P-4) Same as for C-6 except the optional gunpack is replaced with a 50-mm BK 5 cannon
MAX SPEED @ ALTITUDE: 292 mph (470 km/h) @ 15,000 ft (4,572 m)
CEILING: 26,900 ft (8,200 m)
INITIAL CLIMB RATE: 1,770 ft/min (539 m/min)
RANGE: 1,112 mi (1,790 km); 1,696 mi (2,730 km) with drop tanks

* * *

STRENGTHS (ALL VARIANTS)

- Very heavy armament and ordnance load.
- Relatively fast for a medium bomber.

WEAKNESSES (ALL VARIANTS)

- Big and slow compared to enemy fighters; requires fighter protection, especially on low-level missions.
- Unimpressive defensive armament.



Messerschmitt Bf 109G-6 & G-10



Like its British Spitfire counterpart, the Bf 109 evolved to meet new challenges and served throughout the war. The 109G, or Gustav, introduced early in 1943 was not the best 109 (that may have been the aerodynamically cleaner F model), but it was the most numerous. It was also constantly modified: armament changes produced so many bulges and blisters over gun breeches and under wings that some pilots called the 109G *die Beule*--the bump, or boil. The G-10 model, which appeared in 1944, was the fastest of all the 109s, with speed to match most Allied fighters. Despite handling problems from all these aerodynamic compromises, as well as narrow landing gear that contributed to terrifying takeoff and landing characteristics, enemy pilots could never safely discount or dismiss the Bf 109, which remained the preferred fighter of many Luftwaffe aces until the end of the war.



BF 109G-10

BF 109G-10 SPECIFICATIONS**WEIGHT:** 5,880/7,496 lb. (2,667/3,400 kg)**SPAN:** 32' 6.5" (9.92 m) **LENGTH:** 29' 8" (9.04 m)**ENGINE:** One Daimler-Benz DB605D liquid-cooled V-12 with MW-50 water-methanol injection and 1,550 hp (1,850 hp for takeoff)**ARMAMENT:** One 30-mm MK 108 cannon firing through prop hub, plus two 13-mm MG 131 machine guns with 300 r.p.g. mounted above engine**MAX SPEED @ ALTITUDE:** 428 mph (689 km/h) @ 24,250 ft (7,391 m)**CEILING:** 41,000 ft (12,500 m)**INITIAL CLIMB RATE:** 4,820 ft/min (1,469 m/min)**RANGE:** 355 mi (571 km)

BF 109G-6 SPECIFICATIONS**WEIGHT:** 5,880/7,496 lb. (2,667/3,400 kg)**SPAN:** 32' 6.5" (9.92 m) **LENGTH:** 29' 8" (9.04 m)**ENGINE:** One Daimler-Benz DB605A liquid-cooled V-12 with 1,475 hp**ARMAMENT:** One 30-mm Mk 108 or one 20-mm MG 151 cannon firing through prop hub, plus two 13-mm MG 131 machine guns with 300 r.p.g. mounted above engine **Optional:** two 20-mm MG 151 cannon with 150 r.p.g. (The G-6/R2 can mount racks for four 110-lb. bombs or one 550-lb. bomb, plus two WGr 21 rocket tubes)**MAX SPEED @ ALTITUDE:** 387 mph (623 km/h) @ 22,970 ft (7,000 m)**CEILING:** 38,500 ft (11,750 m)**INITIAL CLIMB RATE:** 3,300 ft/min (1,005 m/min)**RANGE:** 450 mi (725 km); maximum range 615 mi (990 km) with belly tank (Bf 109G can carry one 300-liter tank under fuselage or one on each wing)

STRENGTHS (ALL VARIANTS)

- Highly responsive (perhaps too much so).
- Excellent acceleration, climb, and maneuverability.
- Heavy and versatile armament.

WEAKNESSES (ALL VARIANTS)

- Narrow, weak landing gear makes takeoff and landing tricky; plane swings hard to left on takeoff.
- Twitchy handling, heavy controls at high speeds. Uneven slat deployment can make aiming difficult.
- Adding extra wing armament degrades speed, maneuverability, and handling.
- Thin wing and light construction make it more fragile than some other fighters.
- Relatively poor visibility from cramped cockpit.



Messerschmitt Me 262A-1a Schwalbe ("Swallow") and Me 262A-2a Sturm vogel ("Stormbird")

Me 262A



The Messerschmitt Me 262A-1a **Schwalbe** was the first jet fighter to fly in combat; the Me 262A-2a **Sturm vogel** was the fighter-bomber version of this famous Messerschmitt jet. It took a long time to get the initial design into production and service. Some blame Hitler's preference of the **schnellbomber** version for delays in the jet's deployment, but the real problem was getting acceptable engine performance and reliability. This delay kept the Me 262 fighter from entering combat until September 1944. Even then, its Junkers Jumo turbine engines provided poor acceleration, lasted on average less than 25 hours, and stalled or exploded when the throttle was suddenly increased or decreased, leaving it vulnerable to enemy fighters. Despite these problems, the **Schwalbe**'s quadruple cannon armament and the **Sturm vogel**'s twin 30-mm cannon and heavy bomb load could do massive damage to enemy troops, transport, and other targets. The Me 262A-1a/U4 variant, called the **Pulkzerstörer** (bomber formation destroyer), carried a long-barreled 50-mm cannon. This big gun protruded seven feet ahead of the nose and slowed the aircraft by 15 mph, but provided sufficient punch to destroy any vehicle it could hit. Overall the Me 262 provided an impressive glimpse of the future, and more than 1,400 were completed before war's end.



ME 262A-1A SPECIFICATIONS

WEIGHT: 8,514/15,620 lb. (3,870/7,100 kg)

SPAN: 41' 0.125" (12.5 m) **LENGTH:** 34' 9.5" (10.61 m)

ENGINE: Two Junkers Jumo 109-004B turbojets with 1,980-lb. thrust each

ARMAMENT (A-1A): Four 30-mm Mk 108 cannon in nose (upper two with 100 r.p.g. and lower two with 80 r.p.g.) **Optional:** 24 R4M rockets

ARMAMENT (A-1A/U4): One 50-mm BK 5 or Mk 214A cannon

Optional: 24 R4M rockets

MAX SPEED @ ALTITUDE:

(A-1a) 540 mph (869 km/h) @ 36,090 ft (11,000 m)

(A-1a/U4) 525 mph (869 km/h) @ 36,090 ft (11,000 m)

CEILING: 36,090 ft (11,000 m)

INITIAL CLIMB RATE: 3,937 ft/min (1,200 m/min)

RANGE: 525 mi (845 km)

* * *

ME 262A-2A SPECIFICATIONS

WEIGHT: 8,514/15,620 lb. (3,870/7,100 kg)

SPAN: 41' 0.125" (12.5 m) **LENGTH:** 34' 9.5" (10.61 m)

ENGINE: Two Junkers Jumo 109-004B turbojets with 1,980-lb. thrust each

ARMAMENT: Two 30-mm Mk 108 cannon in nose with 100 r.p.g., plus racks for one 2,205-lb. bomb or two 1,100-lb. bombs or two 550-lb. bombs

MAX SPEED @ ALTITUDE: 540 mph (869 km/h) @ 36,090 ft (11,000 m)

CEILING: 36,090 ft (11,000 m)

INITIAL CLIMB RATE: 3,937 ft/min (1,200 m/min)

RANGE: 525 mi (845 km)

* * *

STRENGTHS (ALL VARIANTS)

- High speed; even with full bomb load, 262 is faster than propeller-driven fighters.
- Heavy armament and bomb load.

WEAKNESSES (ALL VARIANTS)

- Jumo turbojets are very fragile and provide short operational life (25 hours or less); cannot withstand even minor combat damage.
- Throttle changes require a delicate touch; engines prone to stall or explode under sudden throttle changes.
- Bomb load decreases speed, the 262's best asset.
- Fighter-bomber role exposes *Sturmvogel* to covering fighters.
- Me 262A-1a/U4's cannon produces a blinding muzzle flash.

VEHICLES AND WEAPONS

One of a tactical pilot's toughest jobs is finding and destroying enemy vehicles and weapons on the ground. You're flying low and fast over a battle zone full of armored and soft-skinned vehicles, infantry and antiaircraft weapons, and their crews. The problem is that many of these potential targets look almost alike, whether they belong to friend or foe. The decisions you make in a split second will make you a hero or



a sap who's doing the enemy's job for him. If you think it's easy to mistake a P-51 for a 109 or vice-versa, see how confident you feel as you reach for the trigger to blast trucks, tanks, or troops on the ground. Are they friendlies who need your help, or enemies who need your ordnance? Look twice, but don't take your time!

GIVE 'EM HELL

**MERCEDES SIX-WHEEL OPEN STAFF CAR**

This fancy vehicle may contain a high-ranking German officer.

Avg/Max speed: 40/80 mph.

* * *

**WILLYS MB "JEEP"**

This small, nimble vehicle may carry a 0.50-in. Browning machine gun, which gives the humble Jeep a long reach and a powerful punch.

Avg/Max speed: 30/65 mph.

* * *

**KÜBELWAGEN**

This little VW makes a small target. If it is carrying an MG 42 machine gun, it can spray out 1,200 rifle-caliber rounds per minute, so exercise caution.

Avg/Max speed: 25/50 mph.

* * *

**HUMBER HEAVY UTILITY CAR**

This unarmed staff car is vulnerable to air attack--strafe on sight.

Avg/Max speed: 25/45 mph.

* * *

**AMBULANCE**

Not very sporting to strafe emergency vehicles!

Avg/Max speed: 25/50 mph.

* * *



FIRE TRUCK

Not very sporting to strafe emergency vehicles!

Avg/Max speed: 25/50 mph.

* * *

GAS TRUCK

Strafing this truck may result in a gratifying explosion.

Avg/Max speed: 25/50 mph.

* * *



HUMBER MK I ARMORED CAR

Helpless against air attack; strafing it may ignite its fuel and ammo.

Avg/Max speed: 25/50 mph.

* * *

**SD KFZ 234 ARMORED CAR**

Helpless against air attack; strafing it may ignite its fuel and ammo.

Avg/Max speed: 25/50 mph.

* * *

**BEDFORD MWD LIGHT TRUCK**

Seen everywhere on the front, this vehicle may be carrying troops or ammunition.

Avg/Max speed: 25/50 mph.

* * *

**GMC 6X6 "DEUCE-AND-A-HALF" TRUCK**

This truck could be carrying anything from troops to ammo to fuel, so it may make quite a big bang.

Avg/Max speed: 25/50 mph.

* * *

**BREN CARRIER UTILITY VEHICLE**

Small, relatively slow, and vulnerable to air attack, this utility vehicle is a common sight in every campaign. Attack at will.

Avg/Max speed: 15/30 mph.

* * *

**OPEL BLITZ 3-TON TRUCK**

This vehicle, seen everywhere on the front, may be carrying anything from troops to ammunition.

Avg/Max speed: 25/50 mph.

* * *

**M3 HALFTRACK**

A small, usually vulnerable target, the halftrack can make an attack from the air a dangerous proposition when it's specially equipped with multiple .50s or even 20-mm or 40-mm AA guns.

Avg/Max speed: 20/45 mph.

* * *



M16 HALFTRACK WITH FOUR 0.50-IN. AA GUNS

Its four 0.50-in. guns make this halftrack dangerous to approach. Strafe it before it rakes your aircraft.

Avg/Max speed: 20/45 mph.

* * *



SD KFZ 251 HALFTRACK

Good strafing target for Allied fighter-bombers. Helpless against air attack; strafing it may ignite its fuel and ammo.

Avg/Max speed: 20/45 mph.

* * *



STUG V SELF-PROPELLED ASSAULT GUN

This self-propelled assault gun is a challenge to enemy tanks on the ground, but an easy target from the air. Hitting it hard enough may yield a big bang.

Avg/Max speed: 12/23 mph.

* * *



M3A1 HALFTRACK

The halftrack is a small target, usually limited to a single machine gun. But some special versions carry multiple .50s or even 20-mm or 40-mm AA guns, making an air attack a dangerous proposition.

Avg/Max speed: 20/45 mph.

* * *



M7 PRIEST SELF-PROPELLED HOWITZER

This howitzer is dangerous to ground troops, but its only weapon against aircraft is a rifle-caliber machine gun. Strafe it on sight; fully loaded with ammo, it may make a big bang if you hit it hard enough.

Avg/Max speed: 12/25 mph.

* * *



WESPE SELF-PROPELLED HOWITZER

This roving artillery makes a more vulnerable target than more heavily armored tanks. Its howitzer is dangerous to ground troops, but its only weapon against aircraft is a rifle-caliber machine gun. Strafe it on sight.

Avg/Max speed: 12/25 mph.

* * *



SD KFZ 10/4 OR 6/2 SELF-PROPELLED FLAK GUN

This halftrack, mounting a 20-mm or 37-mm flak gun, can make things hot for unwary pilots.

Avg/Max speed: 25/40 mph.

* * *



WIRBELWIND SELF-PROPELLED 20-MM FLAKVIERLING

This dark lump on the landscape is well armed: its quadruple 20-mm cannon can be lethal to aircraft within a mile, but if you can hit it without taking a hit yourself, it'll make one big explosion.

Avg/Max speed: 12/25 mph.

* * *



JAGDPANZER TANK DESTROYER

This low-slung tank destroyer is a major threat to enemy armor, but its pair of rifle-caliber machine guns does little to discourage air attack.

Avg/Max speed: 10/22 mph.

* * *



OSTWIND SELF-PROPELLED 37-MM FLAK GUN

This tank chassis carries a 37-mm flak gun that gives it a long reach, but if you hit it before it hits you, it may produce a very big bang.

Avg/Max speed: 12/25 mph.

* * *



HETZER TANK DESTROYER

This light tank destroyer mounts only a single 7.92-mm machine gun to stave off air attacks. Strafe it on sight--and watch out for flying debris.

Avg/Max speed: 12/24 mph.

* * *



M10 TANK DESTROYER

This Sherman-based tank destroyer carries a 0.50-in. machine gun that can ruin an unwary pilot's day, but a well-placed rocket or bomb in its open turret will keep it from killing Axis tanks.

Avg/Max speed: 12/29 mph.

* * *

**ELEFANT TANK DESTROYER**

This ponderous tank destroyer is extremely dangerous to enemy armor, but its slow speed and high profile make it a juicy--and highly explosive--target.

Avg/Max speed: 6/12.5 mph.

* * *

**PANZER IV MEDIUM TANK**

This tank appears in large numbers across the theater. Its 7.92-mm machine guns aren't much of a threat, but it is a relatively small and well-armored target.

Avg/Max speed: 10/24 mph.

* * *

**M26 PERSHING TANK**

This heavy tank's 90-mm gun can kill any German tank, and its 0.50-in. machine gun can bite unwary aircraft. Only your heaviest ordnance will stop it.

Avg/Max speed: 12/24 mph.

* * *

**M4A3 SHERMAN TANK**

With a lot of luck, this tank's single turret-mounted 0.50-in. machine gun could damage or destroy low-flying aircraft. If hit with bombs or rockets, its ammo may ignite, causing quite a fireworks show.

Avg/Max speed: 12/28 mph.

* * *

**PANZER V (PANTHER) MEDIUM TANK**

This tank is tough and requires the roughest treatment you can provide, preferably bombs and rockets; you'll be lucky to do significant damage with 0.50-in. ammo.

Avg/Max speed: 12/28 mph.

* * *

**PANZER VI (TIGER I) HEAVY TANK**

This low-moving tank is tough to crack. Rockets and bombs are your best bet, but you may be able to fire API rounds from behind and bounce some up into a vulnerable spot beneath the engine.

Avg/Max speed: 10/23 mph.

* * *

**TIGER II (KING TIGER) HEAVY TANK**

This 75-ton monster packs a massive 88-mm punch, but its 7.92-mm machine guns provide negligible defense against air attack. To destroy it you'll have to hit it with everything you've got.

Avg/Max speed: 10/23 mph.

* * *

**MK I CENTURION TANK**

This heavy tank's 105-mm gun can kill any German tank, and its 0.30-in. and 0.50-in. machine guns can bite unwary aircraft. Only your heaviest ordnance can stop it.

Avg/Max speed: 15/34 mph.

* * *

**JAGDTIGER HEAVY TANK DESTROYER**

This super-heavyweight tank destroyer carries a big 128-mm main gun and two rifle-caliber MG42s for air defense. You'll have to hit it with everything you've got to keep it from killing Allied tanks.

Avg/Max speed: 10/23 mph.

* * *

**MK VII CHURCHILL TANK**

This big, slow-moving tank can do a lot of damage against enemy tanks and personnel, but it is vulnerable to fighter-bomber attack.

Avg/Max speed: 8/12 mph.

* * *

**JAGDPANTHER HEAVY TANK DESTROYER**

This heavy tank destroyer is a major threat to Allied armor, but it can do little against air attack. Hit it at will, but you'll have to hit it hard.

Avg/Max speed: 14/34 mph.

* * *

**ACHILLES IIC TANK DESTROYER**

This Sherman-based tank destroyer carries a 0.50-in. machine gun that can ruin an unwary pilot's day, but a well-placed rocket or bomb in its open turret will keep it from killing Axis tanks.

Avg/Max speed: 12/29 mph.

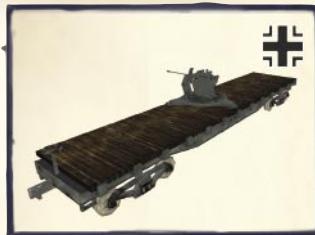
* * *

**LOCOMOTIVE**

When pulling flak cars, locomotives become dangerous targets. Successful strafing may produce huge jets of steam or boiler explosions that can propel large pieces of jagged metal into your flight path.

Avg/Max speed: 25/60 mph.

* * *

**FLAK CAR**

Flat cars may carry 20-mm Flakvierling four-barreled AA guns, especially in front of or behind the locomotive or at the end of the train. If you see multiple muzzle flashes from a flat car, get more distance and altitude ASAP.

* * *

**SCHWERER BRUNO 28-CM (11-IN.) RAILWAY GUN**

This 100-ton monster can drop 550-lb. projectiles on targets 30 miles away. Strafing with guns and rockets, along with a couple of your own 500-pound bombs, can silence this gun and save Allied lives.

* * *

**BOXCAR**

Boxcars can be unresponsive targets, but if the cargo is explosives, you may not have enough altitude to evade explosions propelling large pieces of debris. Boxcars can also contain AA guns: if the sides open and muzzle flashes appear, get more distance ASAP.

* * *

**TANK CAR**

In wartime these probably aren't carrying molasses, but something volatile that could cause a large explosion.

* * *

PILOTS: BEFORE YOU OPEN FIRE,
MAKE SURE VEHICLES BELONG
TO THE ENEMY!

**TOWED 40-MM AA GUN**

A small target on the ground, you may only notice it when its rounds curve in toward you like burning tennis balls. Approach with caution.

* * *

**0.50-IN. AA MACHINE GUN**

A few lucky rounds from this hard-hitting gun can put a fighter-bomber on the ground, but strafing can scatter or kill its crew.

* * *

**105-MM HOWITZER**

A howitzer and its crew can inflict major damage to enemy troops. Strafe or bomb on sight.

* * *

**TOWED 90-MM AA GUN**

This weapon is dangerous to enemy aircraft flying up to 30,000 feet, but a tempting target when under tow.

* * *

**TOWED QUAD 0.50-IN. AA GUNS**

This small target can throw half a Thunderbolt's firepower, making it a deadly threat to low-flying aircraft, but under tow it makes a vulnerable target.

* * *

**105-MM HOWITZER**

This antipersonnel weapon and its crew can do major damage to enemy troops. Strafe or bomb on sight.

* * *

**150-MM HOWITZER**

This antipersonnel weapon and its crew can do major damage to enemy troops. Strafe or bomb on sight.

* * *

**40-MM AA GUN WITH CREW**

A small target on the ground, you may only notice it when its rounds curve in toward you like burning tennis balls. Approach with caution.

* * *

**FLAK TOWER**

This structure contains antiaircraft firepower to threaten attackers from all directions.

* * *

**88-MM DUAL-PURPOSE GUN**

This small target is a major threat to aircraft and tanks alike. Strafe it on sight.

* * *

**AIRFIELD AA GUN EMPLACEMENT**

These deadly emplacements make airfield attacks dangerous, especially if you don't stay low.

* * *

**AIRFIELD AND SHIP DEFENSE BARRAGE BALLOON**

Shooting these gasbags from above can make good target practice; flying beneath them can be fatal if you get tangled in the steel cables that hang beneath them.

* * *

**ONE-MAN RAFT (WITH PILOT)**

A small, helpless, and inappropriate target!

Avg speed: 2 mph.

* * *

**RIVER BARGE (TOWED BY A TUG SINGLY OR IN A LINE)**

Strafing strings of river barges can provide some explosive surprises, depending on what's aboard; be ready to dodge fireballs and flying debris.

Avg/Max speed: 6/12 mph.

* * *

**DUKW AMPHIBIAN**

The "Duck" amphib is another small, slow-moving, and nearly defenseless target on sea or on land. It may mount a .50-in. machine gun; with luck it can hit low-flying aircraft.

Avg/Max speeds: 3/8 mph in water, 20/40 mph on land.

* * *

**TUGBOAT**

Not much of a challenge to strafe a tug, but it does interfere with the shipping the tugboat is there to assist.

Avg/Max speed: 7/15 mph.

* * *

**TYPE VII U-BOAT**

This sub makes an interesting strafing target and a hard one to bomb.

Avg/Max speed: 8/15 mph.

* * *

**E-BOAT**

The E-boat carries light flak armament; its torpedoes make it a potentially explosive strafing target.

Avg/Max speed: 12/35 mph.

* * *

**LCT (LANDING CRAFT, TANK)**

The LCT is big and slow moving; with tanks and ammo aboard, it makes a juicy target.

Avg/Max speed: 6/12 mph.

* * *

**LCI (LANDING CRAFT, INFANTRY)**

The LCI is a small, slow-moving, unarmed target, protected by AA guns on nearby vessels.

Avg/Max speed: 8/16 mph.

* * *

**MERCHANTMAN/CONVOY SHIP**

Merchantmen are slow-moving, easy targets. Their cargo may make for a very large explosion.

Avg/Max speed: 6/12 mph.

* * *

**LST (LANDING SHIP, TANK)**

This is a big, slow-moving target, but its eight 40-mm and twelve 20-mm antiaircraft guns can be pretty discouraging.

Avg/Max speed: 6/12 mph.

* * *

**MTB 5002 GUNBOAT**

This small, agile vessel makes a difficult target. Its torpedoes, fuel, and ammo make it potentially a highly explosive one.

Avg/Max speed: 12/35 mph.

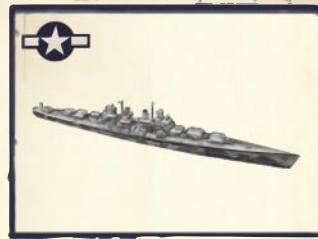
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**TYPE 36A DESTROYER**

The type 36A destroyer is fast and heavily armed, carrying light and heavy antiaircraft armament that makes it a dangerous target for aircraft.

Avg/Max speed: 12/40 mph.

* * *

**BALTIMORE CLASS CRUISER**

Its 74 light and heavy antiaircraft guns plus 5-in. and 8-in. artillery make this big ship a more than terrifying target for attacking pilots. Approach with caution, and don't stick around.

Avg/Max speed: 12/28 mph.

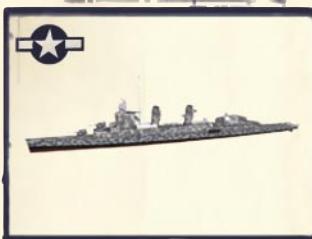
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**TRIBAL CLASS DESTROYER**

This heavily armed ship must be approached with caution, as it can throw up a lot of light but deadly flak. Strafing may not produce dramatic results, but if a bomb finds the ship's magazine, it might make a major-league explosion.

Avg/Max speed: 12/40 mph.

* * *

**FLETCHER CLASS DESTROYER**

The Fletcher-class is one of the largest and most heavily armed American destroyers, carrying serious light and heavy antiaircraft armament. Attacking one from the air can be very dangerous.

Avg/Max speed: 12/40 mph.

* * *

**HIPPER CLASS HEAVY CRUISER**

The Hipper-class is one of the largest and most heavily armed and armored German cruisers, carrying an eight-gun main battery and nearly 50 light and heavy antiaircraft guns. Attack with caution.

Avg/Max speed: 12/40 mph.

* * *

Rheinmetall-Borsig MG 81

7.92 mm

(Ju 88A-4/C6)

PROJECTILE WEIGHT: 0.35 oz. (10 g)

MUZZLE VELOCITY: 2,400 ft/sec
(730 m/sec)

RATE OF FIRE: 1,500 rpm

AMMO TYPES: Armor-piercing, incendiary, and tracer

HIGH LETHALITY REQUIRES: >30 hits

STRENGTHS

- High rate of fire.
- Numerous hits can do major damage.

WEAKNESSES

- Rifle-caliber round lacks range and hitting power of larger guns and cannon.
- If none of your hits strike a vital spot, a well-armored adversary can still get home.

* * *

MG 17 7.92 mm

(Fw 190A-5)

PROJECTILE WEIGHT: 0.35 oz. (10 g)

MUZZLE VELOCITY: 2,600 ft/sec
(790 m/sec)

RATE OF FIRE: 1,100 rpm

AMMO TYPES: Armor-piercing, incendiary, and tracer

HIGH LETHALITY REQUIRES: >30 hits

STRENGTHS

- High rate of fire.
- Numerous hits can do major damage.

WEAKNESSES

- Rifle-caliber round lacks range and hitting power of larger guns and cannon.
- If none of your hits strike a vital spot, a well-armored adversary can still get home.

* * *

Browning MK 2 .303-Cal

(Mosquito F.B. VI/XVIII)

PROJECTILE WEIGHT: 0.395 oz.
(11.3 g)

MUZZLE VELOCITY: 2,740 ft/sec
(835 m/sec)

RATE OF FIRE: 1,200 rpm

AMMO TYPES: Armor-piercing, incendiary, and tracer

HIGH LETHALITY REQUIRES: >30 hits

STRENGTHS

- High rate of fire.
- Numerous hits can do major damage.

WEAKNESSES

- Rifle-caliber round lacks range and hitting power of larger guns and cannon.
- If none of your hits strike a vital spot, a well-armored adversary can still get home.

* * *

Browning M2 .50-Cal

(P-38, P-47, P-51, P-55, P-80,
Spitfire IXe, B-25, B-26)

PROJECTILE WEIGHT: 1.7 oz.
(48.5 g)

MUZZLE VELOCITY: 2,850 ft/sec
(870 m/sec)

RATE OF FIRE: 750 rpm

AMMO TYPES: Armor-piercing, incendiary, tracer, and API (armor-piercing incendiary)

HIGH LETHALITY REQUIRES: 15-20 hits

STRENGTHS

- Flat trajectory, long reach, and good hitting power.
- Short, well-aimed burst can tear a lightweight fighter apart or cause it to explode.
- API round pierces aircraft skin, and then explodes inside structure for maximum damage.
- Can destroy surface targets such as tanks or small ships.

WEAKNESSES

- Lacks destructive power of larger cannon.

* * *

Rheinmetall-Borsig MG 131

13 mm

(Bf 109G-6/-10, Fw 190A-8, Ju 88A-4)
PROJECTILE WEIGHT: 1.2 oz.
(34.6 g)

MUZZLE VELOCITY: 2,400 ft/sec
(730 m/sec)

RATE OF FIRE: 900 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: 15-20 hits

STRENGTHS

- Flat trajectory, long reach, and good hitting power.
- Short, well-aimed burst can tear a lightweight fighter apart or cause it to explode.
- Can destroy surface targets such as tanks or small ships.

WEAKNESSES

- Lacks destructive power of larger cannon.

* * *

Mauser MG151/15 15 mm

(Do 335)

PROJECTILE WEIGHT: 2 oz. (57 g)

MUZZLE VELOCITY: 3,150 ft/sec
(960 m/sec)

RATE OF FIRE: 700 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: >15 hits

STRENGTHS

- Flat trajectory, long reach, and excellent hitting power.
- Short, well-aimed burst can tear a fighter apart.
- Can destroy surface targets such as tanks or small ships.

WEAKNESSES

- Lacks destructive power of larger cannon.

* * *

Oerlikon MG FF 20 mm
(Ju 88C-6)

PROJECTILE WEIGHT: 4 oz. (115 g)

MUZZLE VELOCITY: 1,970 ft/sec
(600 m/sec)

RATE OF FIRE: 520 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: 10-20 hits

STRENGTHS

- Heavy projectile means highly destructive power.
- Numerous hits can do major damage.

WEAKNESSES

- Slow rate of fire.
- Low velocity.
- Projectile can explode on impact instead of penetrating aircraft structure, delivering less than a knockout blow.

* * *

Hispano M2 20 mm

(P-38, P-55, Mosquito F.B. VI,
Typhoon, Tempest, Spitfire IXc/IXe)

PROJECTILE WEIGHT: 4.5 oz. (130 g)

MUZZLE VELOCITY: 2,750 ft/sec
(840 m/sec)

RATE OF FIRE: 600 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: 10-20 hits

STRENGTHS

- Fires a heavy quarter-pound projectile; can inflict major damage.
- High velocity adds to destructive power.

WEAKNESSES

- Bulky ammo limits ammo loadout.

* * *

Mauser MG 151/20 20 mm

(Bf 109G-6, Fw 190A-5/A-8,
Do 335B-2)

PROJECTILE WEIGHT: 4 oz. (115 g)

MUZZLE VELOCITY: 2,330 ft/sec
(710 m/sec)

RATE OF FIRE: 740 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: 10-20 hits

STRENGTHS

- High rate of fire.
- A few hits can do major damage.

* * *

Rheinmetall-Borsig Mk 103

30 mm

(Do 335, Go 229)

PROJECTILE WEIGHT: 11.6 oz.
(330 g)

MUZZLE VELOCITY: 2,800 ft/sec
(860 m/sec)

RATE OF FIRE: 420 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: 1 hit on fighter, 5 hits on medium bomber

STRENGTHS

- With heavy projectile and high velocity, requires very few hits to do the job.

WEAKNESSES

- Relatively low rate of fire.
- Drooping trajectory makes this a close-in weapon, which risks exposure to defensive fire.

* * *

Rheinmetall-Borsig Mk 108

30 mm

(Bf 109G-6/-10, Me 262A-1a/A-2a)

PROJECTILE WEIGHT: 11 oz. (312 g)

MUZZLE VELOCITY: 1,650 ft/sec
(505 m/sec)

RATE OF FIRE: 600 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: 1 hit on fighter, 5 hits on medium bomber

STRENGTHS

- Requires very few hits to do the job.

WEAKNESSES

- Low velocity and drooping trajectory--a drop of almost 100 feet in 1,000 yards--make this a close-in weapon, which risks exposure to defensive fire.

* * *

BK 5 50 mm

(Ju 88P-4, Me 262A-1a/U4)

PROJECTILE WEIGHT: 3.4 lb.
(1.54 kg)

MUZZLE VELOCITY: 3,000 ft/sec
(920 m/sec)

RATE OF FIRE: 50 rpm

AMMO TYPES: Incendiary and high-explosive

HIGH LETHALITY REQUIRES: 1 hit

STRENGTHS

- Massive round delivered at high velocity yields great destructive power.

WEAKNESSES

- Salvo fire almost impossible because of blinding muzzle flash.

* * *

Molins "6-pounder" 57 mm

(Mosquito F.B. XVIII)

GUN WEIGHT: 1,397 lb. (635 kg)
with autoloader and 21 rounds

PROJECTILE WEIGHT: 6.98 lb.
(3.17 kg)

MUZZLE VELOCITY: 2,920 ft/sec
(890 m/sec)

RATE OF FIRE: 55 rpm

AMMO TYPES: Armor-piercing

HIGH LETHALITY REQUIRES: 1 hit

STRENGTHS

- Good rate of fire for heavy gun
- Good accuracy
- Heavy AP round provides excellent penetration and destructive power

WEAKNESSES

- Weight of gun reduces aircraft performance
- Limited ammo supply

* * *

T13E1 75 mm

(B-25H)

GUN WEIGHT: 1,500 lb. (682 kg)
PROJECTILE WEIGHT: 14.5 lb.
(6.60 kg)

MUZZLE VELOCITY: 2,360 ft/sec
(720 m/sec)

RATE OF FIRE: 10 rpm (manually loaded)

AMMO TYPES: Armor-piercing

HIGH LETHALITY REQUIRES: 1 hit

STRENGTHS

- Heavy projectile makes hits devastating

WEAKNESSES

- Manual loading makes for low rate of fire; few rounds can be fired per attack
- Poor accuracy

* * *

Mark 13 Torpedo
(U.S.)

WEIGHT: 2,216 lb. (1,005 kg)
OVERALL LENGTH: 13' 5" (4.089 m)
DIAMETER: 22.4 in. (56.9 cm)
EXPLOSIVE CHARGE: 600 lb. (262 kg)
Torpex
RANGE/SPEED: 6,300 yd.
(5,760 m)/33.5 knots

* * *

Mk XV Torpedo
(British)

WEIGHT: 1,801 lb. (817 kg)
OVERALL LENGTH: 17' 2.75" (5.251 m)
DIAMETER: 17.7 in. (45 cm)
EXPLOSIVE CHARGE: 545 lb. (247 kg)
Torpex
RANGE/SPEED: 2,500 yd.
(2,290 m)/40 knots

* * *

LT F5b Aircraft Torpedo
(German)

(Specifications vary depending on warhead; these are average values)
WEIGHT: 1,685 lb. (765 kg)
OVERALL LENGTH: 15' 9" (4.8 m)
DIAMETER: 17.7 in. (45 cm)
EXPLOSIVE CHARGE: 475 lb. (215 kg)
Hexanite
RANGE/SPEED: 2,200 yd.
(2,012 m)/40 knots

* * *

**R4M 55-mm (2.26-inch)
air-to-air rocket
(German)**

PROJECTILE WEIGHT: 8.8 lb. (4 kg)

MAXIMUM VELOCITY: 820 ft/sec
(250 m/sec)

RANGE: 1,640 yd. (1,500 m)

HIGH LETHALITY REQUIRES: 1 hit for
fighters, 5 hits for medium bombers

STRENGTHS

- Small rocket provides destructive power equivalent to 30-mm cannon against aircraft.

WEAKNESSES

- Poor accuracy necessitates salvo fire.

* * *

**Panzerblitz II 55-mm
air-to-ground rocket
(2.16-inch shaped-charge
version of R4M)
(German)**

PROJECTILE WEIGHT: 8.8 lb. (4 kg)

MAXIMUM VELOCITY: 820 ft/sec
(250 m/sec)

RANGE: 1,640 yd. (1,500 m)

HIGH LETHALITY REQUIRES: 1 hit for
soft-skinned vehicles, >2 hits for
tanks

STRENGTHS

- Small rocket provides destructive power equivalent to 30-mm cannon against armored vehicles.

WEAKNESSES

- Poor accuracy necessitates salvo fire.

* * *

**"60-pounder" RP (rocket
projectile with 3-in. body
and 5-in. warhead)
(British)**

PROJECTILE WEIGHT: 60 lb. (27 kg)

MAXIMUM VELOCITY: 1,575 ft/sec
(480m/sec)

RANGE: 875 yd. (800 m)

HIGH LETHALITY REQUIRES: 1 hit

STRENGTHS

- Heavy, fast-moving projectile and large explosive charge makes for heavy destructive power.

WEAKNESSES

- Bulky launch rails degrade aircraft performance.

* * *

**Panzerschreck 3.46-in.
(88-mm) antitank rocket
with launch tube
(German)**

PROJECTILE WEIGHT: 7 lb. (3.2 kg)

MAXIMUM VELOCITY: 345 ft/sec
(105 m/s)

RANGE: 130 yd. (120 m)

HIGH LETHALITY REQUIRES: 1 hit

STRENGTHS

- Can penetrate heavy armor.

WEAKNESSES

- Low velocity, limited range.
- Unguided rockets lack accuracy.
- Bulky rockets and launch tubes degrade fighter speed and stability.

* * *

**M8 4.5-in. (11.4 cm)
antitank rocket with M10
triple-tube launcher
(U.S.)**

PROJECTILE WEIGHT: 6.26 lb.
(2.8 kg)

MAXIMUM VELOCITY: 880 ft/sec
(268 m/sec)

RANGE: 1,200 yd. (1,100 m)

HIGH LETHALITY REQUIRES: 1 hit

STRENGTHS

- Can penetrate heavy armor.

WEAKNESSES

- Low velocity, limited range.
- Unguided rockets lack accuracy.
- Bulky rockets and launch tubes degrade fighter speed and stability.

* * *

**5-in. (12.7-cm) High-
Velocity Aircraft Rocket
(HVAR)
(U.S.)**

PROJECTILE WEIGHT: ≈ 50 lb.
(22.7 kg)

MAXIMUM VELOCITY: 1,050 ft/sec
(320 m/sec)

RANGE: 1,200 yd. (1,100 m)

HIGH LETHALITY REQUIRES:

Detonation within 15 yd. for aircraft, 1 direct hit for tanks

STRENGTHS

- Effective against ground targets; can destroy trucks, tanks, small vessels, and structures.

WEAKNESSES

- Drooping trajectory makes this an ineffective air-to-air weapon.

* * *

WGr 21 8-in. (21-cm)
air-to-air rocket

(German)

PROJECTILE WEIGHT: 90 lb. (41 kg)
warhead

MAXIMUM VELOCITY: 1,200 ft/sec
(365 m/sec)

RANGE: 1,310 yd. (1,200 m)

HIGH LETHALITY REQUIRES:

Detonation within 30 yd. for air-
craft, 1 direct hit for tanks

STRENGTHS

- 90-lb. warhead has devastating explosive power.
- Can stop a heavy tank.

WEAKNESSES

- Bulky rockets and launch tubes degrade fighter speed and stability.
- Unguided rockets lack accuracy.

* * *